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The Aesthetical Impacts of Quick Response (QR) Codes in Apparel Design to Revitalize Handcrafts

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Abstract

Embroidery serves as a complex semiotic framework, creating a covert language of cultural symbols that works on diverse social and psychological dimensions; for centuries, the practice of hand embroidery thrived before entering a decline phase. The influence of modern art directions, besides the utilization of machinery, contributed remarkably to the decline of this craft. Symbols are crucial elements in cultural production; they communicate cultural values and are a ubiquitous component of human existence; nowadays, QR codes, which are considered modern-day symbols, mirror the human reliance on technology which appears in the inevitable integration of QR codes in our daily activities; the incorporation of QR codes in the clothing and crafts sector provides evolutionary opportunities for fashion designers as the codes bridge the divide between physical products and the digital world. The research problem can be articulated in the following questions: How can QR code technology and fashion design foster a novel path that promotes handicrafts? What actions can the designer take to raise awareness of the cultural significance and implications of embroidery handcraft? What are the hand embroidery craft's historical and cultural context and symbolic implications? What is the possibility of creating a fashion design collection where a QR code is implemented aesthetically and functionally? The research's Importance is to highlight a new direction where information communication technology (ICT) can be used to revive handcrafts in addition to presenting new QR code applications in fashion design and education, also to support craftsmen by trying to keep their crafts from extinction through raising awareness of their value and symbolism. The research followed the analytical, experimental methodology, studying the historical progression of embroidery and symbols in Egypt across the Ancient Egyptian, Coptic, and Islamic eras; the research also covered the QR code technology, embroidery tools, and materials in addition to commonly used hand embroidery stitches. The researchers proposed a fashion design collection for women aged 25-35, featuring interactive clothes ornamented with hand-embroidered QR codes and other decorative motifs inspired by pixel art. When the code is scanned via smartphone, a document appears providing information on the embroidery history in Egypt, tools, materials, and stitches. The proposed fashion designs were evaluated through a specialist and academic questionnaire of five axes, and the results were tested statically by SPSS 25; the designs were ranked from the highest to the lowest (Design 4, Design 5, Design 1, Design 2, Design 6, and Design 3).

Keywords

QR Code, Hand Embroidery, Symbols, Handcrafts, Clothing Design.

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Introduction

Clothes, symbols, handcrafts, and culture mutually interchange significant insights, facilitating communication among individuals. Clothes serve as a noteworthy means of communication, fostering social connections among individuals, as they can encapsulate memories, evoke narratives, and be utilized for motives beyond their appearance and function; they have the propensity to function as a reflection of an individual community and culture (Tharakan, 2011).

Symbols embedded in clothes and textile products have served as carriers of cultural values

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throughout history, playing a vital role in culture creation and acting as persistent elements in human societies. They are tightly knotted to the human experience, originating from it and carrying a significance that exceeds individual practices to comprise principal ideals (Tajuddin, 2018).

This research explores the historical use of symbols in Egypt and their representation using hand embroidery, their significance, communicative efficacy, and reflection of societal changes throughout different eras, this study delves into the current implication of QR codes as symbols of modern culture, predominant in a society driven by technology.

It also inspects how QR code technology can act as a catalytic agent for hand embroidery revival and the spread of crafts knowledge among people, incorporating aesthetically QR codes within fashion designs. By scanning the codes, the audience can access information related to hand embroidery, tools, historical significance, and stitches.

This paper theoretically discusses the QR code technology, the history of Embroidery in Egypt, and its symbolic significance.

The practical section involves designing a fashion collection of six designs, executing QR codes with the hand embroidery technique, and creating a questionnaire for academics and field experts to evaluate the viability of using QR codes in fashion designs to revive handcrafts. It also involves determining the designs' ranking within the collection.

The research problem can be articulated in the following questions:

1- How can QR codes and fashion design foster a novel path that promotes handcrafts?
2- What actions can the designer take to raise awareness of the cultural significance and implications of embroidery handcraft?
3- What are the hand embroidery craft's historical and cultural context and symbols implications?
4- What is the possibility of creating a fashion design collection where QR code is implemented aesthetically and functionally?

Research Importance

1- To highlight a new direction where we can use information communication technology (ICT) to revive handcrafts.
2- To mention new QR code applications in fashion design and education.
3- To support craftsmen by trying to keep their crafts from extinction through raising awareness of their value and symbolism.

Research Hypothesis

1- Symbols embroidered in clothing have cultural significance and embedded meanings throughout history.
2- Keeping pace with technological development by using QR codes in fashion design to revive handicrafts
3- There are no statistically significant differences between the proposed designs inspired by QR codes in the same collection.

Research limits

Designing women's wear handcrafted collection with QR codes according to the latest fashion trends in the context of the following:

1- Place limits: Egypt (in the historical context of hand embroidery) and in the targeted clients for the fashion collection Time limit: Spring/Summer 2025
2- Human limits: Outwear suitable for women from 25-35 years.
3- Materials limit: 100% natural fibers and upcycled materials.

Research tools

The researchers prepared a questionnaire to seek the opinions of academics and field experts to evaluate the proposed designs, which rely on the aesthetic and functional use of quick response codes in fashion design to revive handicrafts.

Literature Review

Symbols

Symbols convey cultural values, they are key elements in cultural production, and are a prevalent component of human existence. They are intricately linked to human life, deriving from human experience and imbued with meaning that extends past individual practices to encompass supreme concepts.

Culture

Encompasses a complex reciprocity of ideas, symbols, and values in the context of human behavior (Tajuddin, 2018).

Signification

This term pertains to the knowledge of one thing leading to the knowledge of another. In contrast, the first thing is the signifier, and the second is the signified, so if the signifier is verbal, the connotation is verbal. If it is otherwise, the connotation is non-verbal (Alagha& Hassan, 2000).

Cultural Symbolism

According to symbolic and interpretive anthropologists, cultural symbolism revolves around individuals attributing meanings to their environment and expressing these interpretations through cultural symbols present in their art and language.

Design

Design in any form of craftsmanship should not be

viewed only as an embellished object but as a creation infused with symbolic function and purpose. Symbols implanted in cultural artifacts can be captivating instruments for conveying social messages or perspectives to the populace (Das, 2021).

Subsequently, knowledge regarding traditional arts and crafts should be dispersed among communities; the prompt and precise recording of iconography is vital for preserving cultural heritage and enabling the sharing of knowledge across various geographical areas. It is important to prioritize the official acknowledgment of each craft, founding an archive of traditional craftsmanship, and developing tutorials and manuals to preserve them from extinction (Ruiz, n.d.).

Quick Response (QR) Code

Quick Response (QR) code is a two-dimensional matrix barcode presented by Denso Wave (a member of the Toyota group of companies) in 1994. It was originally used to track parts used in automobile manufacturing (Desai, 2022).

It is designed to be read by smartphones. QR code encompasses a white background with black modules arranged in a square pattern. The information included in a QR code may be text, a URL or other data it is also intended to be decoded at high speed (Shin et al., 2012).

QR code has readable flexibility as it is read nevertheless of its position; it does not need to be scanned from one specific angle, as QR code scanners are capable of defining the right way to decode the symbol due to the three specific squares that are positioned at its corners & the alignment blocks (Chandure, 2013).

Advantages of QR code:

1- Rapid and Expedient: Offering a speedy, convenient data-accessible methodology.
2- Cost efficiency: They provide a cost-effective way for information storage and distribution; they can also be printed in a very small size, embroidered, or transferred on various materials at a relatively low cost.
3- Multifaceted: QR codes can be utilized in an extensive variety of applications, including marketing, payment dispensation, managing inventory, and authentication.
4- Traceable: QR codes offer valuable data for marketing and analysis, as they can be designed to trace user engagement (Pranto, 2023).

QR generation process

1. Access any QR code generator website, choose the form of data needed to be encoded, then upload, type, or paste the data the generator requests. Some websites offer further customization options, for instance, size selection, background color modification, or embedding an image to the code, then click to generate the QR code (Coleman, 2011).

QR code the modern-day cultural symbol

ICT (Information Communication Technology) has been instrumental in connecting people to heritage, presenting a diversity of channels that provide extensive information. Recently, technological advancements such as QR Code can enhance the level and quality of people's communications with heritage (Solima &Izzo, 2017).

In the process of QR codes generation, designers are constantly keen to stabilize the effectiveness of the symbol which is communicating effectively, letting the audience understand the meaning conveyed by QR codes through the action of code scanning.

QR codes grants an instinctive form of expression and points to the designer's thoughts and conceptual consciousness. In respect, QR codes has a symbolic indicative significance (Li, 2023).

QR code in the fashion industry

QR codes embedded in clothes provide evolutionary opportunities for individual fashion designers and brands. The codes conduit the gap between physical products and digital world also the gap between offline promotion and online marketing.

Appending QR codes on clothes provides more information to potential customers as they allow the designer to add video content, URLs, and PDF documents (QR Code Shimp, n.d.).

Fashion designers are taking advantage of opportunities provided by QR codes incorporating technology with craftsmanship.

Handcrafts

Are crafted goods produced manually, often utilizing basic tools. Mechanical tools are likewise permissible as long as the artisan's direct manual involvement remains the predominant factor in the creation of the final product (Mohi Ud Din, 2014).

Handicrafts present concrete manifestations of the cultural heritage of a country or ethnic group, representing traditional aspects of socio-economic life, even if these artisanal activities are not fully affecting the national economic metrics (Abdelrazik, 2019).

Embroidery

Embroidery is a complex semiotic framework, employing a diverse range of colors, patterns, stitches, and surface embellishments; it creates a hidden language of cultural symbols that function on diverse social and psychological levels (Modathi &Karolia 2023).

Embroidery can be defined as embellishing a

woven or felted material with a needle, thread, beads and other materials. It developed from the practical need to piece cloth or skins together for the purpose of protection against climate thereby enabling ancient man to migrate and survive all over different regions. Thereafter, it advanced to serve the purpose of ornamentation or to identify a person, replacing ancient tattoos or body painting (Durrant, 2009).

Types of embroidery

Thread embroidery

It means combining the ground material (fabrics) with another material (threads). Hand embroidery stitches are employed using thread and a needle.

Bead embroidery

It is the use of traditional embroidery techniques using beadwork, this type of embroidery can be used to create inordinate clothing collections. Beadwork is one of the most artistic products that has been associated with humans since ancient times. It reflects a specific time, place, cultural values and craftsmanship (Mohamed, 2012).

Embroidery tools and materials

Needles

A short steel piece with a sharp point on one end and a small hole on the other, the type of embroidery and thread should be well-thought-out when selecting a needle.

Crewell needles: Sizes from 1 to 10, they are of medium-length with sharp tips, wide eyes, and are commonly used for basic embroidery stitches.

Chenille needles: Sizes from 13 to 26, longer sharp pointed needles with wider eye and more needle thickness, works best with heavy yarns.

Tapestry needles: Sizes from 13 to 26 with blunt tip, similar to chenille in size, most effective for counting threads in embroidery (Embroidery tools, n.d.).

Threads

Made of cotton, silk, linen, and metal.

Embroidery floss: comes in various lengths, and it consists of six strands that can be separated. That's why it's also known as the Stranded Cotton Thread. To control the thread thickness for different fabrics and embroidery, you can adjust by pulling out the desired number of strands.

Cotton Perle: Also called Pearl Cotton, it is available in round, ball-shaped yarns, these threads cannot be separated like cotton floss. Pearl cotton creates nice texture and is excellent for making detailed stitches that outline shapes. These threads are available in different sizes, the thickest thread is typically size #3 and the finest is size #12 (Sarah, n.d.).

Materials

Fabrics can be classified by Fiber types, weave structure, weight, and thread count: Fibers (natural, manmade).

Fiber types: Natural, manmade.

Weave structure: woven fabrics (cotton, linen, silk, hemp, rayon, and polyester), knitted (French terry cloth, cotton jersey), nonwoven (felt).

Weight: Lightweight – 50-150 GSM, like muslin, chambray, gauze; medium weight 150-250 GSM, like Calico, linen fabrics, and linen-cotton blends; Heavyweight 250-450 GSM, like Heavy linen, rigid denim.

Thread count: Thread count per inch (TPI), is a measure of the coarseness or fineness of fabric. It is measured by counting the number of threads in one square inch of material, thread count is often used to measure the quality of the fabric, good quality fabrics start at 180 – 200 or higher (Iljaseviciute, 2022), (Embroidery Legacy, 2021).

Embroidery aiding tools

Tracing paper, pencils, markers, a light table, a pincushion for needles, pins, and a thimble for finger protection, hoops and frames to prevent the fabric from puckering while embroidering, pinking shears, scissors, small scissors, and iron (Wasilowski, 2018).

Embroidery in Egypt

Embroidery is a historically spread craft in Egypt it has prominent connection to religious beliefs, customs and traditions. It still exists with its distinctive style in small villages and in most of the rural areas.

Ancient Egyptian embroidery

The ancient Egyptian civilization began thousands of years ago, reflecting the Egyptians life. It was a totally religious civilization built on explicit beliefs and ideas. Ancient Egyptians used decorative patterns and symbols inspired by their natural surroundings. Their adornment style and personality maintained consistent due to the robust bonds to religious beliefs (Beshry, 2022).

Throughout the Bronze Age (2000-800 B.C.E.), the metal needle was invented; as early as 2100 B.C.E., the Egyptian kings' clothes were adorned by a net of colored silk thread or beads, the oldest extant embroidered pieces were found in Egyptian tombs (Leslie, 2007).

Hand embroidery was employed to decorate royals, priests' clothes, and special occasional attires, and it was also used to ornament the coffins of the

deceased. Embroidery motifs in ancient Egypt reflected their environment and surroundings; it included botanical elements using the blue Egyptian water Lily, the palm, the lotus, the papyrus, and the chrysanthemum, as well as the geometric patterns of birds, animals, and humans. Besides, there are hieroglyphic letters (Yashar, 2016).

Beadwork was among the clothing items, such as necklaces and wide belts that covered the chest and buttocks of ancient Egyptian women. The Pharaohs used beads as a single unit or as a group composed of decorative units. Bead making has been considered a valuable skill since ancient times, and this craft was shrouded in secrecy for centuries.

The embroideries collection found in the tomb of the famous Egyptian pharaoh, Tutankhamun (died c. 1323 BC), is considered one of the oldest existing embroideries groups (TRC Lieden, 2017).

Tunics of Tutankhamun (c. 1341 BC-c. 1323 BC)

Howard Carter discovered the tomb of Tutankhamun in 1922; one of the artifacts was a sleeved tunic that has the king's name embroidered on 26 cartouches embedded into the woven collar sewn around the neck. The tunic was made differently from the archetypal Egyptian method. By looking at various contemporary tomb paintings it would appear that these garments were of the type worn by the Mitanni (people who live northern Syria) (Eastwood, 2021).

Appliqués of blue-green and brown wide linen pieces decorated with geometric patterns were sewed on both sides of the linen tunic.

Additional four woven bands with the same color palettes but different decorative patterns surround a large panel of embroidered floral and animal motifs close to the tunic's hem. The back of the tunic is decorated with a similar scheme. The neck-opening which has the Ankh shape is formed by a curved woven collar and a yoke embroidered with the king's cartouche and trimmed with a narrow-woven band (Hoskins, 2011).

Crowfoot and Davies specified that two types of stitches (chain and outline) were employed to produce complex motifs, including palmettes, griffins, sphinxes, and scenes of hunting.

Other tunics with sewn-on beads, gold discs, and plaques were discovered (Eastwood, 1993).

Table (1) Some ancient Egyptian symbols significance

Symbol/motif	Signification
Lotus	It represented the concept of creation, the ancient Egyptians used to watch the lotus floating and opening it`s petals in the morning, and closes in the afternoon going under the water (Hassan, 2016).
Uraeus	A cobra positioned upright with its hood expanded. it symbolized protection, as it protects the gateways of the underworld, besides guarding the royal family from enemies and led deceased pharaohs through the underworld (McIntosh, 2022).
Cartouche	The oval-shaped cartouche surrounds royal names written in hieroglyphic; it symbolized the pharaoh as a ruler.
Ankh	It symbolized life (The British Museum, 2019).
Papyrus	Symbol of lower Egypt’s rich and fruitful land, the papyrus stem symbolizes growth, freshness, novelty, prosperity, energy and youth (Wikipedia, n.d.).
Gazelle	Fertility, beauty, and rebirth
Lions	Symbolized supremacy and control. Pharaohs used them to demonstrate their authority to rule (Ferris, 2024).

Coptic embroidery

Coptic art is considered as an extending practice of the artistic and aesthetic principles of the ancient Egyptian art. This can be ascribed to the artists' preference towards simplification, conciseness, symbolism, abstraction, and incorporation of religious themes and symbols in their artworks.

The word Copt is derived from the Greek word Aigyptios, which means 'Egyptian.' After 641, Muslim Arabs called Egypt Dar al-Qibt, or the house of the Copts (Janssen, 2013).

It began around the 3rd century BC after Alexander the Great ruled Egypt; the decorative elements of the Coptic textile can be artistically divided into three categories: the Greco-Roman, the transitional, and the Coptic (Clarysse & Geens, 2007).

The Greco-Roman phase

It extended from the 1st to the 3rd century AD; the Greek culture in Egypt had influences on the textile decorations during the Ptolemaic rule, resulting in a distinguished style known as the Hellenistic; this style embodied the Greek mythology themes through using human, animal, and pictorial motifs. The Greeks were distinguished by precision and innovation in their compositions; in addition, they were inspired by ancient Egyptian motifs such as papyrus and palm leaves. They also used various

geometric shapes and drawings of mythical animals and birds to embroider their clothes (The Artifacts Encyclopedia in Syria, n.d.).

Transitional phase

Textiles in this period are characterized by being a link between the Greco-Roman and the Coptic era, The Greco-Roman motifs and themes were used with some modification and stagnation of movement. It shifted its focus away from representing nature and used Christian iconography (Assaf et al., 2023)

The Coptic phase

A novel artistic style arose, that came from Egypt influenced by the Egyptian traditions. Eastern, homegrown, and isolated from the Hellenistic civilization of the colonial ruler. (Alam, 1980).

Coptic art is characterized by its individuality, and lasting legacy, even during the Arab conquests of Egypt and being a part of the Islamic caliphate. It reached a refined decorative style that resonated with the natural environment. The artistic expressions deviated from realistic representation of nature, to simplification and abstraction.

During that era, Coptic artists deceased from the reliance on repetitive ornamentation of human, animal, and birds' motifs, to utilizing geometric shapes like circles and semi-circles (Abd El Salheen, S., 2013).

Although the dissimilarity between Coptic and ancient Egyptian art, the Coptic is influenced by the latter, particularly in terms of materials and techniques and the decorative elements were altered and renovated to match the Egyptian Christian belief (Mabrouk, 2020).

The embroidery was initially done with wool and linen, seldom with silk, and occasionally with gold and silver threads using chain stitch, cross stitch, whipped running stitch, satin stitch, stem stitch, and split stitch (Shimeon, 2010).

Table (2) Some Coptic symbols significance

Symbol/motif	Signification
Acanthus	Represented peace and heavenly gardens (Hassan, 2023).
Vegetal motifs	Vegetal motifs were common symbols of guard and good luck, particularly when they are accompanied with animal motifs (Willamette university, n.d.).
Ankh	Was the symbol for life in ancient Egypt, this symbol passed to early Coptic art work to symbolize the cross of Christ.
Dancers and hunters' figures	Represented victory and strength (Cultural Heritage, n.d.).
Olive leaves branch	Symbolized peace (Guirguis et al., 2020)
Grapes	Grapes, leaves, and vines signified Christ (Hassan, 2023).
Human figures	In Coptic art, humans face has symbolic meanings conveying spiritual concepts over physical appearances, wide eyes for enlightened thinking and short legs symbolized richness.
Fish	In early Christianity the fish symbolized the mistreated Christians secret faith.
Palm fronds	Symbolized Jesus's entrance to Jerusalem, and it also referred to the conquest of the martyrs on suffering and death (Michael, 2011).
Wheat	It signified the intersection of the earthly realm and the communion secret (Hassan, 2023).
Birds, pigeons	Symbolized victory.
The ram and the lamb, the incense burner and the burning ember.	Triangle symbols of evil and sins (Sadek, 2012).
Pomegranate	Symbolized offspring and the church's benevolence that spreads like seeds and the cohesion of the church`s members (Malika& Arafat, 2024).

Islamic embroidery

The textile industry developed during the Islamic era systematically, there was a gradual shift from humans and animals' motifs that were in the Coptic art to a distinguished increase in the use of geometric patterns and Arabic calligraphy, which emerged as a prominent feature in Islamic textile Industry (Hassan, 2020).

Methods of embellishing clothes with textile bands have continued, featuring the integration of Arabic inscriptions containing the Caliph's name, the country in which the cloth was woven, the date of its weaving, the name of minister and the manufacturer. This procedure made the design

horizontal, in order to accommodate the added textual content (Nasr & Elgamal, 2012).

Silk thread was frequently used to decorate embroidered fabrics, no matter what material the fabric was made of, it was introduced to Egypt during the early Abbasid period. Various counted-thread stitches were used in Egypt, typically placed along a base line created by pulling a single weft thread (Kerner, 2007).

Tiraz

The narrow definition of Tiraz textiles refers to patterns on fabrics that represent belonging to an exclusive network led by the Islamic empire caliph; these fabrics were given out as a yearly bonus to officials and administrators or as gifts distributed to favored courtiers or significant visitors from other countries. They are known for encompassing prescribed inscriptions that follow strong guidelines; Tiraz factories were Public (amma) for everyone or private (Khaasa) for the Caliph and the court (McWilliams & Sokoly, 2021).

Umayyad era

The Umayyad style arose as the pioneering artistic practice in Islamic embroidery with Umayyad caliphs' clothes incorporating motifs inspired of the Persians and the Romans into their artistic expressions, thereby sustaining continuity within the pre-Islamic textile industry.

This style continued until the reign of Caliph Abd al-Malik ibn Marwan, during which a decree was issued mandating the use of Arabic script on the textile. Furthermore, the Umayyad governor of Egypt, Abd Allah ibn Abd al-Malik, instructed the Muslim populace in Egypt to don a distinctive attire, thereby manifesting in the textile industry components such as Arabic letters or the use of Arabic script (The Artifacts Encyclopedia in Syria, n.d.).

Stitches used: back stitch, running stitch, and chain stitch. They also used silver and gold threads in their embroidery (Nasr & Elgamal, 2012).

Abbasid era

Decorations during this time were woven by colorful wool and linen, later they produced woven fabrics embroidered with silk, and embellished with jewels and precious stones. Women typically wrote intricate poems on fabric and clothing sleeves as a tradition.

Tiraz factories were established in the delta region creating textiles with inscriptions and the date, besides decorative silk bands, they were embellished on a linen backing and embroidered using silk thread that has different colors than that of the textile (Imam, 1990).

Round vessels were employed, encompassing floral motifs interchanging with animal motifs, in addition to using the tree of life. Some decorations comprised two opposite lines of floral Arabic writing that enclosed a row of identical animals depicted in a decorative mutated manner, adornment such as braids or spiral lines were used, along with geometric decorations of rhombuses and adjacent circles containing decorative elements, positioned below, there was a horizontal band containing Kufic inscriptions (Nasr & Elgamal, 2012).

Stitches used: Chain stitch, blanket stitch, and the buttonhole scallop's stitch (Sejeny, 2015).

Fatimid era

The decorative elements began to fill the entire space of the fabric. The decorative surface became very narrow, delicate and precise encompassing animal and plant motifs inside hexagonal circles or rhombus shapes, others contained calligraphy, geometric shapes, animal motifs or all combined, ensuring proportion and attention to linking all these artistic elements into one integrated unit (Karkoty, 1999).

Under the rule of the Fatimid caliph Al-Mu'izz (r. 953-975), the khil'a (Robe of honor) ceremony status increased. During this ceremony, the Caliph would bestow distinguished people robes of prestige as a form of recognition. Tiraz garments showed the affluence and power of those who received them; the inscriptions found on many textiles recorded fresh affiliations, confirmed devotion to God and then to the Caliph, and granted respect and honor to the recipient (Ekhtiar& Julia, 2015).

Tiraz textiles characteristically use embroidery stitches such as running, stem, split, or chain to create curved, smooth lines. The herringbone stitch was also famous in this era.

Mamluk and Ayyubid era textiles

The situation transformed in the Ayyubid and Mamluk era, the embroidered textiles from Egypt was higher in quality dated back to the start of the Ayyubid rule in the late 12th century. This shows that an outside influence came into Cairo society. The Ayyubid rulers from Syria had a strong interest in superior embroidery techniques.

Early embroideries were created on a first-class linen fabric (Barnes& Ellis, 2013).

In the Mamluk era, there was an extensive utilization of needlework in embellishing several types of clothing, such as tunics, trouser leg edges, belts, waistbands, scarves, headwear, footwear, and kerchiefs. Household textiles were embroidered, encompassing a variety of items such as curtains, towels, pillowcases, and cloths utilized as coverings and wrappers, protective covers for trays, baskets, water-cooling vessels, and ceramic jars (Ellis,

2001).
Stitches used: running stitches, herringbone stitch, double running stitch, and variations of Gobelin stitch (a diagonal filling stitch), split stitch, slanted buttonhole stitch (Lamm, 1942).
Satin stitch and chain stitch (Sejeny, 2015). In addition to zigzag stitch, cross stitch, back stitch, darning stitch, and a' jour stitch (Nasr & Elgamal, 2012).

Ottoman era

In the Ottoman era, the Egyptians embroidered on felt silk fabrics, pillows, muslin rugs, handkerchiefs, dresses, and belts. One of the most beautiful types of embroidery is that made of gold and silver. The Ottomans were famous for the art of embroidery, and this art was widespread among the peasants in their villages (Elgerbeed & Abd Elrazek, 2023).

Several types of hand embroidery stitches were used in embroidering the written strips, including the backstitch, the stem, chain stitch, the satin, and the Herringbone stitch.
The script embroidery was executed carefully and in an ornamental style, achieving the aesthetic aspect and proportions in the form of the letters of words, and used several types of Arabic scripts, including soft Kufic without rotation in the early Islamic era, and then the hard Kufic script with angles spread (Yashar, 2016).
Other stitches were used such as: Bullion knot stitch, shadow stitch, darning stitch (Nasr, 2000).
In addition to cross stitch, couching stitch (Sejeny, 2015). Serma, blanket stitch, buttonhole stitch, running stitch, and braided chain stitch (Nasr & Elgamal, 2012).

Table (3) Some Islamic symbols significance

Symbol/motif	Signification
Arabesque: type of decoration consists of botanical motif it is a continuous and perpetual pattern (Kamal et al., 2020).	The Infinite model is symbol of the oneness of Allah, meaning that God is one, has no beginning and no end (Nada, 2016).
The circle	The circle represented unity, completion, wholeness and demonstrates diversity in creation, it symbolizes God's infinite nature, and the Islamic faith in one God (Qais, 2024).
Five-pointed star	The five points symbolized human. The top point represents the head then two arms and below are two legs. In Islamic belief, the five points symbolized. the five daily prayers and five principles of Islam (Faraz, 2023).
The nine-pointed star	The nine-pointed star signifies completeness and excellence because number nine is the highest digit among all the other one-digit numbers, it represented union and wholeness (Qais, 2024).
Triangle	The triangle is representative of human consciousness and the value of harmony (Cbomere, 2011).
Square	Represents strength, establishment and perfection (Bahareh, 2015).
Flowers	Floral patterns signified nature (Ghasemzadeh, 2013).
Tree of life	Signified the excessive and enormous knowledge rising from the Islamic world.
Animals	Animal symbols signified people, but their meanings varied based on the context in which they were used. Lions: signified power (Stub, 2016).
Calligraphy	The Arabic script was used as an ornamental element besides spreading Allah`s words (Castle and gazelle, 2023).

Modern Embroidery

For centuries, the practice of embroidery thrived before entering a phase of decline. The influence of modern abstract art directions, besides the utilization of machinery and the exclusion of traditional activities such as sewing and needlework from educational curricula, contributed remarkably to the decline of this craft. However, the efforts of fashion houses, emerging sustainable local brands, and NGOs help promote this special craft as they employ embroidery in various clothes and related products. Also, this move empowers individuals to engage in personal creative expression, showcasing the artistic possibilities of embroidery, which, in the end, helps in the revival of this authentic craft (The Artifacts Encyclopedia in Syria, n.d.).

Embroidery stitches

A variety of stitching techniques are now utilized in contemporary hand embroidery executing different designs, as shown in Fig. (1) which showcases commonly employed embroidery stitches.

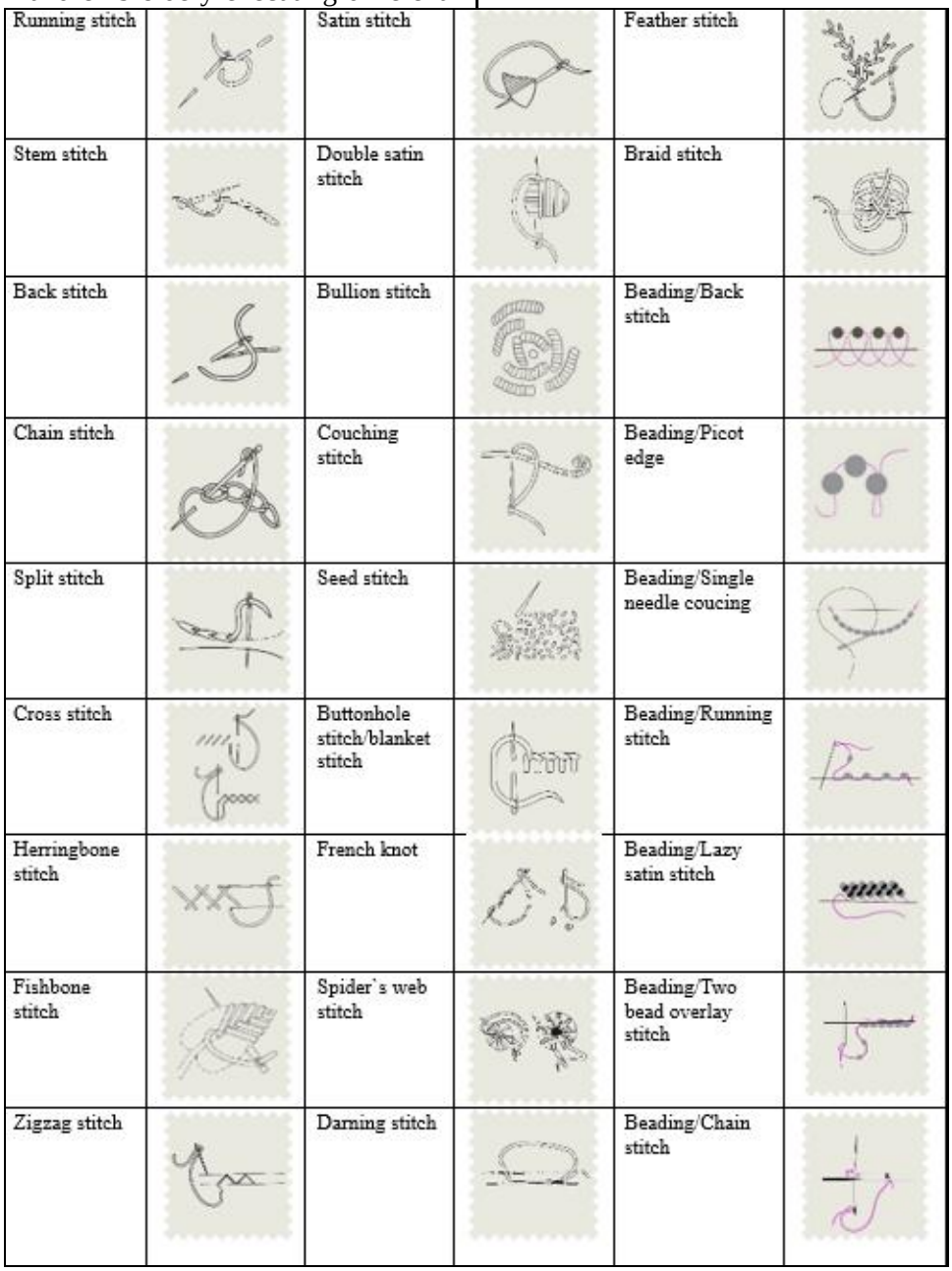

Fig.1. Embroidery stiches diagram, drawn by the researcher from the references (Galleta, 2013), (Stitch guide, n.d.), (Christie, 1921), (Coats & Clark Design Team, 2018), (NCERT, 2018), (Oladipo, n.d.), (Wilson, n.d.), (Conlon, 2001), (Long, 2002).

2. Experimental and Methodology

The study follows the experimental analytical research methodology, where the researcher designed a fashion mini collection of six outfits these garments included handmade embroidered QR code which is implemented aesthetically all along with pixels-like decorative motifs.

Research methodology

The study follows the experimental analytical research methodology, where the researcher designed a fashion mini collection of six outfits these garments included handmade embroidered QR code which is implemented aesthetically all along with pixels-like decorative motifs.

The process

1- The first step: Creating a separate document entiteled "Embroidery History in Egypt" using Canva.com to be uploded to the QRcode, this document belongs to a series entitled the crafts guide, it contains detailed content on the definition

of handcrafts and embroidery, embroidery tools and materials, the historical context of hand embroidery in Egypt, and the significance of some embroidery symbols, in addition to encompassing 27 commonly used embroidery stitches definitions and diagrams as shown in Fig. (2). Scan the QR code below to see the full document.

Fig. (2) Screenshot from the document "Embroidery History in Egypt"

2- The second step: Uploading this document into the QR generator website and then creating the QRcode see Fig. (3)

Fig. (3) The generated QR code

3- The third step: Creating the designs where the QRcode is implemented

Table (4) Designs and Description

Design no.	Sketch	Description
Design 1		Description: Three pieces outfit - A long-sleeved basic dress with cuffs and a ruffle below knee length. - Wrapped knee-length dress with short sleeves and a lapel collar. - Cloth belt with two large pockets and buttons in the middle. Materials: Upcycled materials and 100% organic cotton. Embellishment technique: Thread hand embroidery. Colors: Base fabrics and embroidery: PANTONE 19-1103 TCX Espresso, PANTONE 11-0601 TCX Bright White, PANTONE 15-0954 TCX Symphonic Sunset, PANTONE 16-1255 TCX Russet Orange, PANTONE 19-2434 TCX Festival Fuchsia, PANTONE 14-4123 TCX Clear Sky, PANTONE 19-3954 TCX Bluing, PANTONE 16-5422 TCX Bright Aqua.

Design no.	Sketch	Description
Design 2		Description: Two pieces outfit - A long-sleeved asymmetric shirt above waist length with cuffs and classic shirt collar. - A-line below knee length black skirt with waist gatherings above there are two white triangular cuts tied in the middle. Materials: Upcycled materials and 100% organic cotton. Embellishment technique: Thread hand embroidery. Colors: Base fabrics and embroidery: PANTONE 19-1103 TCX Espresso, PANTONE 11-0601 TCX Bright White, PANTONE 15-0954 TCX Symphonic Sunset, PANTONE 18-4051 TCX Strong Blue.
Design 3		Description: Two pieces outfit - Waist line length asymmetric jacket with bishop sleeves, cuffs and high neck. - High waist knee length barrel skirt with inverted pleats, and decorative cuts. Materials: Upcycled materials and 100% organic cotton. Embellishment technique: Thread hand embroidery. Colors: Base fabrics and embroidery: PANTONE 19-1103 TCX Espresso, PANTONE 11-0601 TCX Bright White.
Design 4		Description: Three pieces outfit - Sleeveless basic shirt with a classic collar. - Below knee dress, the front and back are divided into three panels with two slits in the front and two cloth stripes to be tied; the dress has a waist cut and butterfly sleeves. - Maxi circular skirt. Materials: Upcycled materials and 100% organic materials. Embellishment technique: Thread hand embroidery. Colors: Base fabrics and embroidery: PANTONE 19-1103 TCX Espresso, PANTONE 11-0601 TCX Bright White, PANTONE 15-0954 TCX Symphonic Sunset, PANTONE 16-1255 TCX Russet Orange, PANTONE 19-2434 TCX Festival Fuchsia, PANTONE 14-4123 TCX

Design no.	Sketch	Description
		Clear Sky, PANTONE 19-3954 TCX Bluing, PANTONE 16-5422 TCX Bright Aqua.
Design 5		Description: Two pieces outfit • Long-sleeved Chanel basic dress with a V-neck. • Sleeveless dress with two side slits starting from the hipline with a waist cut and other decorative cuts at the shoulders and hem. Materials: Upcycled materials and 100% organic cotton. Embellishment technique: Thread hand embroidery. Colors: Base fabrics and embroidery: PANTONE 19-1103 TCX Espresso, PANTONE 11-0601 TCX Bright White.
Design 6		Description: Three pieces outfit - Cropped long sleeve shirt with winged collar. - Maxi circular skirt consists of three horizontal cuts the first ends with circular edges, the second consists of pleats while the third is plain with opposite color. Materials: Upcycled materials and 100% organic material. Embellishment technique: Thread hand embroidery. Colors: Base fabrics and embroidery: PANTONE 19-1103 TCX Espresso, PANTONE 11-0601 TCX Bright White, PANTONE 15-0954 TCX Symphonic Sunset, PANTONE 16-1255 TCX Russet Orange, PANTONE 19-2434 TCX Festival Fuchsia, PANTONE 14-4123 TCX Clear Sky, PANTONE 19-3954 TCX Bluing, PANTONE 16-5422 TCX Bright Aqua.

4- The fourth step: Executing the QRcode using hand thread embroidery on linen fabric, check Fig. (4).

Fig. (4) Thread hand embroidered QRcode on linen fabric

5- The fifth step: Designs evaluation through a questionnaire.

Questionnaire methodology

An online questionnaire created on Google Forms was used to conduct quantitative research, the questionnaire was answered by total of 24 specialist, divided into 19 academics between professors, assistant professors, lecturers, and PhD holders, and 5 field experts and specialists.

Questionnaire axes

The Questionnaire included five axes each of three points, each of them is placed on a 5-point scale, from 1 as the least to 5 as the highest.

Table (5) The Questionnaire axes and points

Axes
First Axis: Design Principles
The proposed design achieves rhythm.
The proposed design achieves balance.
Clarity of unity between the design principles.
Second Axis: Design Element
The structural lines in the proposed design are aligned.
The colors of the proposed design are compatible with each other.
The shapes in the proposed design are compatible.
Third Axis: Aesthetic Values
The proposed design is authentic.
The proposed design keeps pace with international fashion trends.
Aesthetic values are achieved by the proposed design.
Fourth Axis: Functional Values
The suitability of manufacturing the proposed design utilizing the upcycling technique and handicrafts
Functional values are achieved by the proposed design
The proposed design is appropriate for women in the age group between 25 and 35
Fifth Axis: Using Quick Response (QR) codes in Fashion Design
Using QR codes in fashion design is compatible with current consumer`s trends
Keeping pace with technological development by using QR codes in fashion design to revive handicrafts
Suitability of using the QR code design as a decorative unit in the proposed design

Results and Discussion

Data Analysis

Data were collected, automated and then analyzed using SPSS 25 software through descriptive statistics (the mean and standard deviation).

Table (6) The Specialist survey (Academic and Industry Specialists) for the First Axis" Design Principles" for Design (1) to Design (6)

Design	The proposed design achieves rhythm			The proposed design achieves balance			Clarity of unity between the design principles			Total		rank
	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	%	
Design 1	4.00	1.063	80	4.33	0.963	87	4.29	0.908	86	4.21	84%	3
Design 2	3.96	1.197	79	4.08	1.100	82	4.25	1.032	85	4.10	82%	4
Design 3	3.88	0.992	78	3.96	0.955	79	3.92	0.881	78	3.92	78%	6
Design 4	4.42	0.776	88	4.38	0.711	88	4.29	0.955	86	4.36	87%	1
Design 5	4.08	1.100	82	4.38	0.711	88	4.38	0.770	88	4.28	86%	2
Design 6	4.13	0.797	83	4.17	0.917	83	4.00	1.142	80	4.10	82%	5
Total	4.08	0.99	82	4.22	0.89	84	4.19	0.95	84	4.16	83%	

Table (6) shows the statements 1 to 3 for the first Axis (Design Principles) and the respondents on the specialist survey (academia and industry field) answers means percentages for the six designs, According to Table (6) agreement on individual statements had arithmetic means ranging between 3.92 and 4.36, which are equivalent to a range of 78% to 87%. The highest agreement was on Design (4) and (5) 4.28 (86%) and 4.36 (87%). The lowest agreement was on Design (3), the arithmetic mean of responses was 3.92 (78%), and the total average for the First Axis Design Principles for (Design1 to 6) is 4.16 (83%) as show in Fig. (5), by this results the third hypothesis is proved.

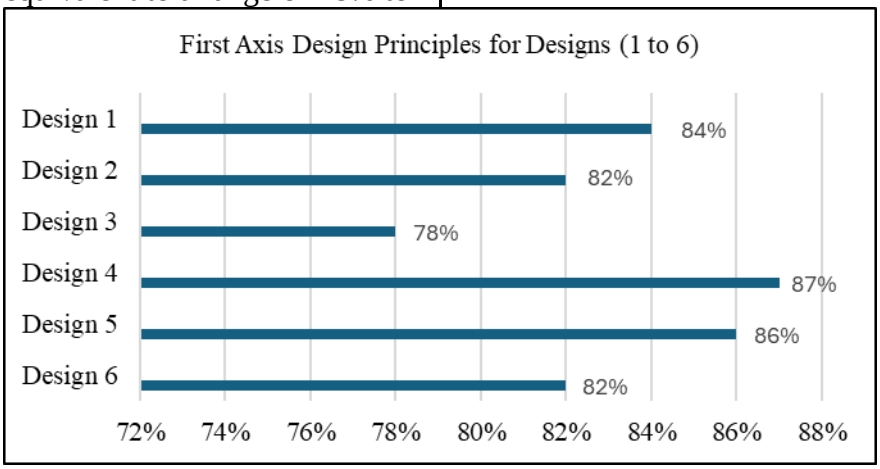

Fig. (5) First Axis Design Principles for Design (1) to Design (6)

Table (7) The Specialist survey (Academic and Industry Specialists) for the Second Axis Design Element for Design (1) to Design (6)

Design	The structural lines in the proposed design are aligned			The colors of the proposed design are compatible with each other			The shapes in the proposed design are compatible			Total		rank
	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	%	
Design 1	4.04	1.197	81%	4.33	0.963	87%	4.04	1.042	81%	4.14	83%	4
Design 2	4.04	1.042	81%	4.25	0.989	85%	4.21	0.977	84%	4.17	83%	3
Design 3	3.83	0.963	77%	3.83	1.274	77%	3.88	1.154	78%	3.85	77%	6
Design 4	4.54	0.721	91%	4.46	0.779	89%	4.29	0.908	86%	4.43	89%	1
Design 5	4.25	0.989	85%	4.46	0.658	89%	4.38	0.824	88%	4.36	87%	2
Design 6	4.13	0.797	83%	4.08	1.100	82%	4.08	1.060	82%	4.10	82%	5
Total	4.14	0.95	83%	4.24	0.96	85%	4.21	0.977	84%	4.20	84%	

Table (7) shows the statements 1 to 3 for the second Axis (Design Elements) and the respondents on the specialist survey (academia and industry field) answers means percentages for the six designs, According to Table (7) agreement on individual statements had arithmetic means ranging between

3.85 and 4.43, which are equivalent to a range of 77% to 89%. The highest agreement was on Design (4) and (5) 4.36 (87%) and 4.43 (89%). The lowest agreement was on Design (3), the arithmetic mean of responses was 3.85 (77%), as show in Fig. (6), the total average for the Second Axis Design Elements for Design (1) to Design (6) is 4.20 (84%), by this results the fourth hypothesis is proved.

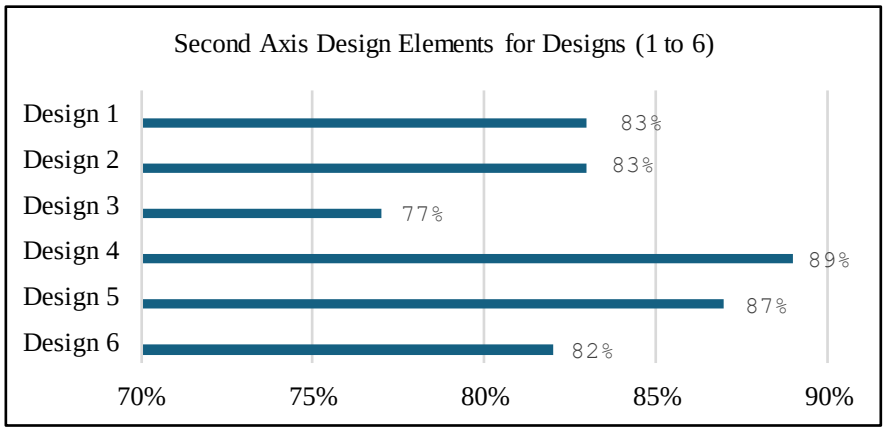

Fig. (6) For the Second Axis Design Element for Design (1) to Design (6)

Table (8) The Specialist survey (Academic and Industry Specialists) for the Third Axis Aesthetic Values for Design (1) to Design (6)

Design	The proposed design is authentic			The proposed design keeps pace with international fashion trends			Aesthetic values are achieved by the proposed design			Total		rank
	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	%	
Design 1	4.33	0.917	87	4.42	0.881	88	4.42	0.830	88	4.39	88%	1
Design 2	4.17	1.129	83	4.21	0.932	84	4.29	0.806	86	4.22	84%	4
Design 3	3.88	1.076	78	3.75	1.294	75	3.96	0.999	79	3.86	77%	6
Design 4	4.46	0.658	89	4.33	0.761	87	4.33	0.963	87	4.37	88%	2
Design 5	4.25	0.897	85	4.21	0.884	84	4.38	0.770	88	4.28	86%	3
Design 6	4.04	1.083	81	4.08	0.881	82	3.96	0.806	79	4.03	81%	5
Total	4.19	0.975	84	4.17	0.961	83	4.22	0.873	84	4.19	84%	

Table (8) shows the statements 1 to 3 for the third Axis (Aesthetic Values) and the respondents on the specialist survey (academia and industry field) answers means percentages for the six designs, According to Table (8) agreement on individual statements had arithmetic means ranging between 3.86 and 4.39, which are equivalent to a range of 77% to 88%. The highest agreement was on Design (1) and (4) 4.37(88%) and 4.39 (88%). The lowest agreement was on Design (3), the arithmetic mean of responses was 3.86 (77%) as show in Fig. (7), the total average for the Third Axis Aesthetic Values for Design (1) to Design (6) is 4.19 (84%), by this results the fifth hypothesis is proved.

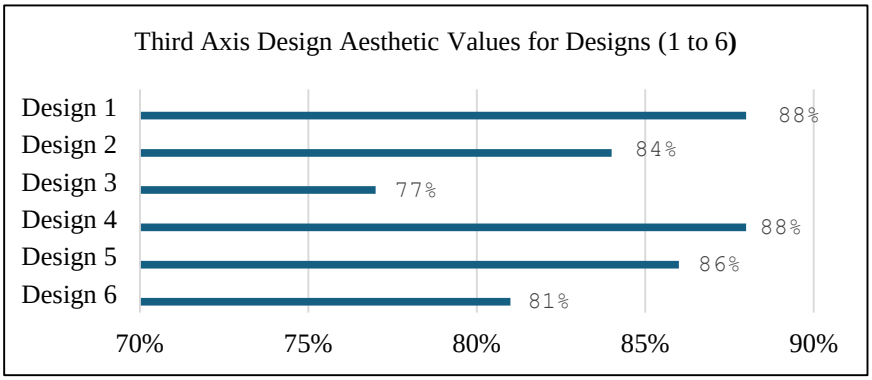

Fig. (7) For the Third Axis Aesthetic Values for Design (1) to Design (6)

Table (9) The Specialist survey (Academic and Industry Specialists) for the Fourth Axis Functional Values for Design (1) to Design (6)

Design	The suitability of manufacturing the proposed design utilizing the upcycling technique and handicrafts			Functional values are achieved by the proposed design			The proposed design is appropriate for women in the age group between 25 and 35			Total		rank
	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	%	
Design 1	4.13	1.296	83%	4.13	1.227	83%	4.25	1.032	85%	4.17	84%	4
Design 2	4.25	1.032	85%	4.38	0.875	88%	4.25	1.152	85%	4.29	86%	3
Design 3	4.00	1.022	80%	3.79	1.250	76%	4.08	1.060	82%	3.96	79%	6
Design 4	4.33	1.007	87%	4.46	0.721	89%	4.38	0.770	88%	4.39	88%	2
Design 5	4.54	0.588	91%	4.38	0.924	88%	4.50	0.722	90%	4.47	90%	1
Design 6	4.00	1.142	80%	4.29	0.806	86%	4.08	0.974	82%	4.12	83%	5
Total	4.21	1.037	84%	4.24	0.996	85%	4.26	0.959	85%	4.24	85%	

Table (9) shows the statements 1 to 3 for the fourth Axis (Functional Values) and the respondents on the specialist survey (academia and industry field) answers means percentages for the six designs, According to Table (9) agreement on individual statements had arithmetic means ranging between 3.96 and 4.47, which are equivalent to a range of 79% to 90%. The highest agreement was on Design (5) and Design (4), 4.39 (88%), 4.47 (90%). The lowest agreement was on Design (3), the arithmetic mean of responses was 3.96 (79%), show in Fig. (8), the total average for the Fourth Axis Functional Values for Design (1) to Design (6) is 4.24 (85%) as by this results the Third hypothesis is proved.

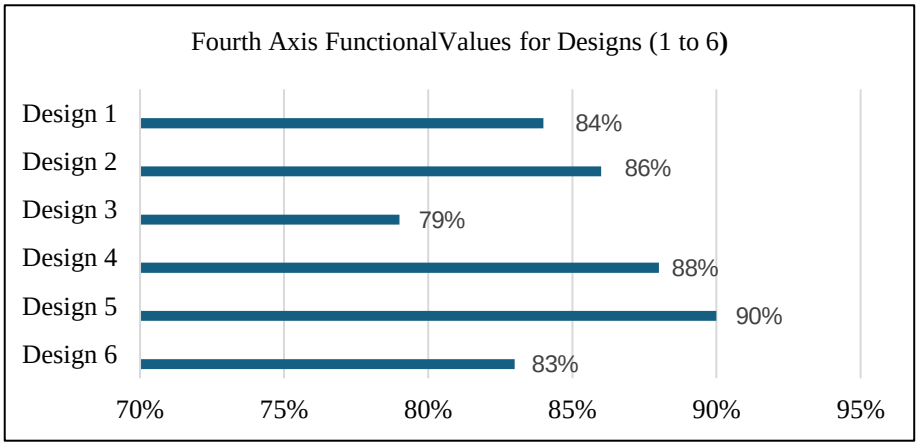

Fig. (8) For the Fourth Axis Functional Values for Design (1) to Design (6)

Table (10) The Specialist survey (Academic and Industry specialists) for the Fifth Axis Using Quick Response (QR) codes in Fashion Design for Design (1) to Design (6)

Design	Using QR codes in fashion design is compatible with current consumer`s trends			Keeping pace with technological development by using QR codes in fashion design to revive handicrafts			Suitability of using the QR code design as a decorative unit in the proposed design			Total		rank
	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	%	
Design 1	4.29	0.806	86%	4.17	0.917	83%	4.04	1.122	81%	4.17	83%	4
Design 2	4.17	1.007	83%	4.38	0.875	88%	4.17	1.049	83%	4.24	85%	2
Design 3	3.83	1.129	77%	4.04	1.122	81%	3.96	1.197	79%	3.94	79%	6
Design 4	4.13	0.992	83%	4.38	0.576	88%	4.42	0.584	88%	4.31	86%	1

Design	Using QR codes in fashion design is compatible with current consumer`s trends			Keeping pace with technological development by using QR codes in fashion design to revive handicrafts			Suitability of using the QR code design as a decorative unit in the proposed design			Total		rank
	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	Std. Deviation	%	Mean	%	
Design 5	4.08	1.100	82%	4.33	0.816	87%	4.25	1.073	85%	4.22	85%	3
Design 6	4.13	0.900	83%	4.08	1.060	82%	4.13	0.797	83%	4.11	83%	5
Total	4.10	0.987	82%	4.23	0.906	85%	4.16	0.987	83%	4.16	83%	

Table (9) shows the statements 1 to 3 for the Fifth Axis (Functional Values) and the respondents on the specialist survey (academia and industry field) answers means percentages for the six designs, According to Table (10) agreement on individual statements had arithmetic means ranging between 3.94 and 4.31, which are equivalent to a range of 79% to 86%. The highest agreement was on Design (4) and Design (2). The lowest agreement was on Design (3), the arithmetic mean of responses was 3.94 (79%) as show in Fig. (9), and the total average for the Fifth Axis Using Quick Response (QR) codes in Fashion Design for Design (1) to Design (6) is 4.16 (83%) by this results the seventh hypothesis is proved.

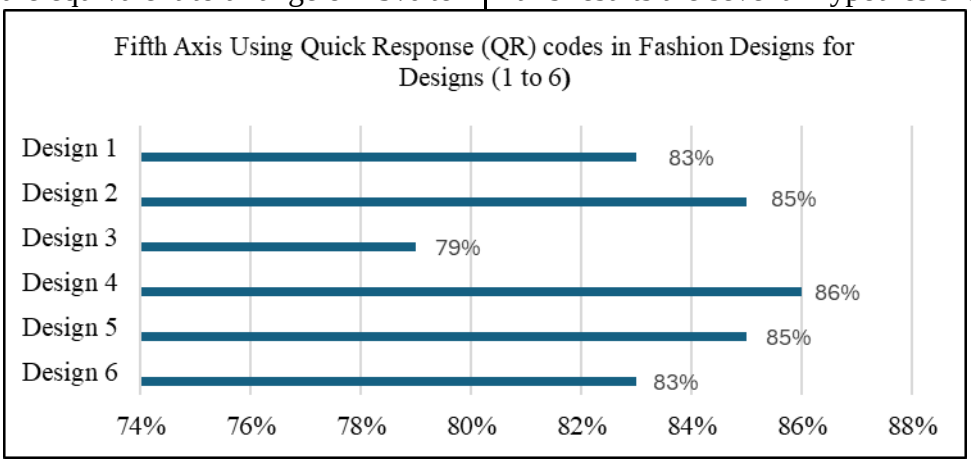

Fig. (9) For the Fifth Axis Using Quick Response (QR) codes in Fashion Design for Design (1) to Design (6)

Significance is assessed at 5 % level of significance with p value was set at (p>0.05)

Table (11) Order of Importance

Design	Mean	Std. Deviation	DF	F	SIG
Design 1	63.21	13.679	5	.972	.437
	63.21	13.679			
Design 2	63.04	13.732			
	63.04	13.732			
Design 3	58.58	14.255			
	58.58	14.255			
Design 4	65.58	9.930			
	65.58	9.930			
Design 5	64.83	11.020			
	64.83	11.020			
Design 6	61.38	12.111			
	61.38	12.111			

To assess whether these differences were due to the group means differences related to the proposed designs inspired from QR codes, a one-way analysis of variance was chosen to analyze the

fashion collection inspired from QR codes. Sum of 6 designs inspired were analyzed using ANOVA. Table (11) demonstrates the results of this analysis ($p>0.05$) showing that the designs don't show significant differences according to the means differences f=0.972, SIG=0.437, this implies that the volatility of the data from the design samples shows consistency and no variability. The designs are ranked from the highest to the lowest as (Design 4, Design 5, Design 1, Design 2, Design 6, and Design 3), as shown in Fig. (10) by this results the eighth hypothesis is proved.

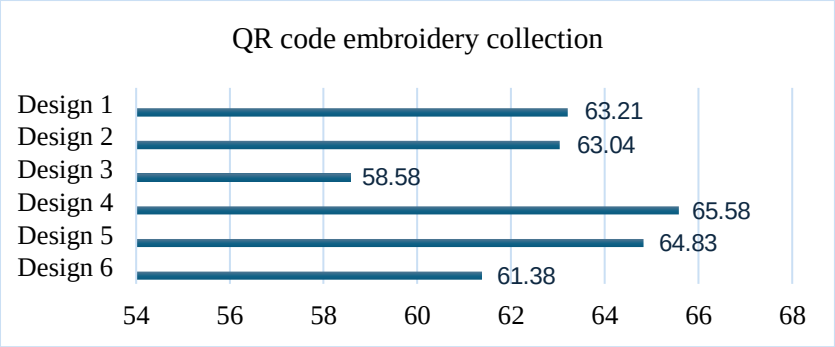

Fig. (10) Order of Importance

Summary and key findings

Symbols convey cultural values; they are key elements in culture production and prevalent components in human existence; They evolved and had semantic shifts to adapt with different cultural, environmental and religious circumstances throughout different periods. Similarly, QR Codes the modern-day symbols reflect the human reliance on technology. The practice of embroidery entered a phase of decline due to the influence of modern abstract art directions, besides the utilization of machinery and the exclusion of traditional activities such as sewing and needlework from educational curricula, the researchers adopted a new approach using QR Codes in fashion design to revive the embroidery handcraft through raising awareness of the significance and value of this craft. The researchers proposed a fashion design collection featuring interactive clothes ornamented with hand-embroidered QR codes and other decorative motifs inspired by pixel art, when the code is scanned, a document appears providing information on the embroidery history in Egypt, embroidery tools and materials, and embroidery stitches; the proposed fashion designs were evaluated through a specialist and academic questionnaire of five axes and the hypothesis of the research were validated as follows:

1- The first hypothesis (Symbols embroidered in clothing have cultural significance and embedded meanings throughout history) was validated through studying the historical context of embroidery in Egypt across the Ancient Egyptian, Coptic, and the Islamic eras, mentioning how symbols are originated from religious beliefs, cultural traditions, and daily experiences.
2- The second hypothesis (Keeping pace with technological development by using QR codes in fashion design to revive handicrafts) is validated as the academics and field specialists validated this hypothesis in the questionnaire with total average agreement of 85%.
3- The third hypothesis (There are no statistically significant differences between the proposed designs inspired by QR codes in the same collection) is validated as no significant differences where observed according to the means differences between the six designs, f=0.972, SIG=0.437, this implies that the volatility of the data from the design samples shows consistency and no variability, but the designs are ranked according to the order of importance from the highest to the lowest as (Design 4, Design 5, Design 1, Design 2, Design 6, and Design 3).

Recommendations

The researchers aim to execute the highest ranked design soon, in addition to using this approach for reviving and raising awareness towards more handcrafts. It is highly recommended for researchers and designers of different disciplines to adopt this approach and to contribute in the preserve of traditional handcrafts as they are a concrete manifestation of the cultural heritage of a country, representing traditional aspects of socio-economic life (Abdelrazik, 2019). It is also recommended to use this approach in documenting historical artifacts and costumes, as well as employing Qr codes children's clothes or adults with Alzheimer's containing their family contacts in case they got lost.

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